

# Predicting Harmful Algal Blooms (HABs) in Lake Erie: HAB Tracker

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Before attending this meeting, had you heard of the HAB Tracker tool?

A. Yes

B. No

C. Sounds familiar/  
Maybe

Have you used HAB Tracker before?

A. Yes

B. No

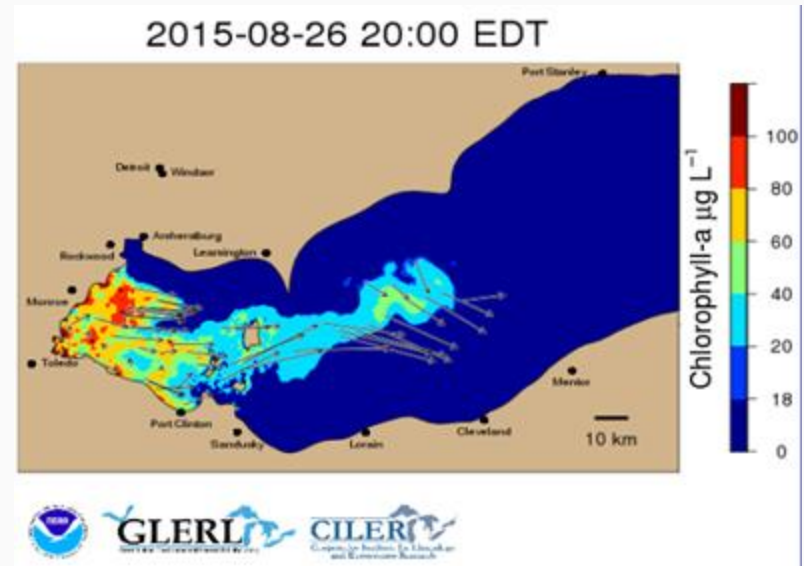
C. Not sure

# NOAA's HAB Tracker

- Experimental, short-term forecast model
- Daily updates & 5 day predictions

## Purpose:

- Where are blooms?
- How big are they?
- Where are they likely headed?



# HAB Tracker: [www.glerl.noaa.gov](http://www.glerl.noaa.gov)

The screenshot shows the GLERL website interface. At the top, the URL [www.glerl.noaa.gov/res/HABs\\_and\\_Hypoxia/](http://www.glerl.noaa.gov/res/HABs_and_Hypoxia/) is visible in the browser's address bar. The GLERL logo and NOAA logo are prominently displayed. Below the logos, the text "NOAA - Great Lakes Environmental Research Laboratory" is shown. A navigation menu includes links for Home, Quick Links, About Us, Research, Data & Products, Publications, and Education. A dropdown menu is open under "Quick Links", listing various resources. A yellow arrow points to "Algal Blooms and Hypoxia". Below the menu is a map of Lake Erie with a color scale for Chlorophyll-a concentration in  $\mu\text{g L}^{-1}$ , ranging from 0 (dark blue) to 100 (dark red). The map shows higher concentrations in the western and central parts of the lake. To the right, a "Resources" section features a "Lake Erie Monthly Algal Bloom Early Season Projection" report with charts and a "Lake Erie HABs Bulletin (Experimental)" link.

www.glerl.noaa.gov/res/HABs\_and\_Hypoxia/

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Chlorophyll-a  $\mu\text{g L}^{-1}$

Resources

Lake Erie Monthly Algal Bloom Early Season Projection



Lake Erie HABs Bulletin  
(Experimental)

Bulletin Sign Up

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### Great Lakes HABs and Hypoxia

 Water Quality and Monitoring Data	 Lake Erie HAB Bulletin	 Near Real-Time Western Lake Erie Microcystin Sampling
 Hyperspectral and Satellite Algorithms	 Western Lake Erie HAB Tracker	 Central Lake Erie Hypoxia Warning System
 Frequently Asked Questions	 Publications	 Flickr HAB Photo Gallery

The NOAA Great Lakes Harmful Algal Blooms (HABs) and Hypoxia program is a collaborative effort between scientists at GLERL and the [Cooperative Institute for Limnology and Ecosystems Research \(CI-LEER\)](#). Our team is focused on understanding ecosystem health effects in the Great Lakes related to human-influenced water quality degradation. We use an integrated approach to understand the environmental drivers of and predict HABs and hypoxia. This approach consists of using satellite images, remote sensing, buoys, a comprehensive monitoring program in Lake Erie, Saginaw Bay, and Lake Huron, and advanced genetic techniques to understand the long and short-term seasonal dynamics of HAB and hypoxic events. The data we collect is used to inform predictive models used by key Great Lakes stakeholder groups, such as drinking water managers. Effective management of coastal ecosystems

# HAB Tracker: Animated Forecasts

www.glerl.noaa.gov/res/HABs\_and\_Hypoxia/habsTracker.html



## Lake Erie HAB Tracker - \*\*\* EXPERIMENTAL \*\*\*

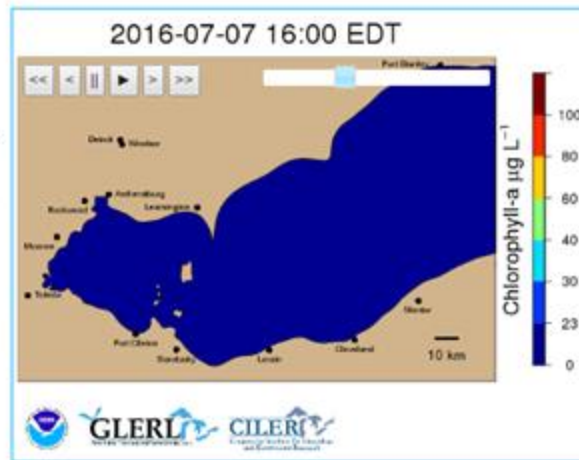
[Back to the GLERL HABs and Hypoxia Page](#)

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### Tracking potential Harmful Algal Blooms

The HAB Tracker is a tool that combines remote sensing, monitoring, and modeling to produce daily 5-day forecasts of bloom transport and concentration. This product takes daily satellite imagery and real-time monitoring to estimate the current expanse and intensity of the bloom, where we can use forecasted meteorology and hydrodynamic modeling to predict where the bloom will travel and what concentrations are likely to be seen on a 3-dimensional scale. These predictions can provide water intake managers timely information for public health decision-making.

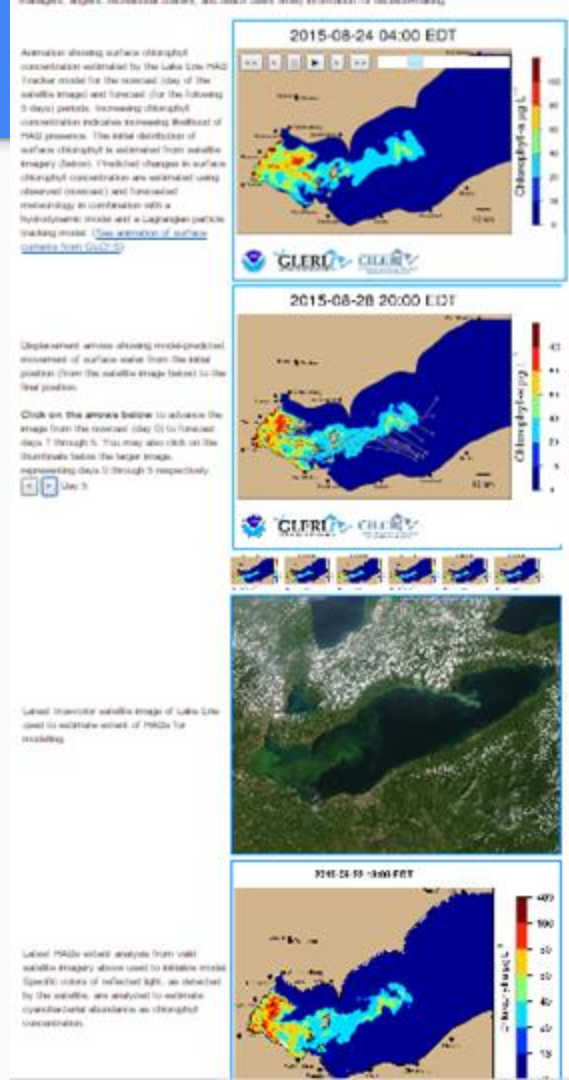
Animation showing surface chlorophyll concentration estimated by the Lake Erie HAB Tracker model for the nowcast (day of the satellite image) and forecast (for the following 5 days) periods. Increasing chlorophyll concentration indicates increasing likelihood of HAB presence. The initial distribution of surface chlorophyll is estimated from satellite imagery (below). Predicted changes in surface chlorophyll concentration are estimated using observed (nowcast) and forecasted meteorology in combination with a hydrodynamic model and a Lagrangian particle tracking model. ([See animation of surface currents from GLCFS](#))



2016-07-08 00:00 EDT

# HAB Tracker: Interpretation?

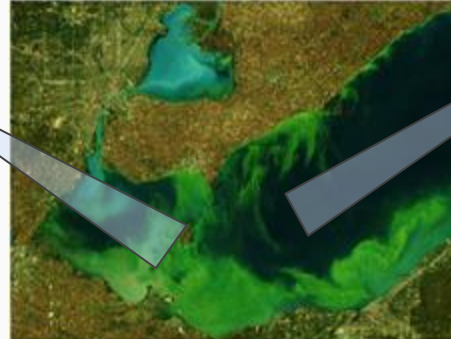
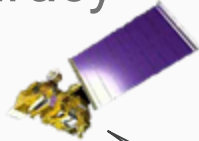
- Animated 5 day forecast of surface concentrations
- 5 day forecast images with displacement arrows
- Latest satellite true-color image of HAB extent
- Satellite image in HAB Tracker format





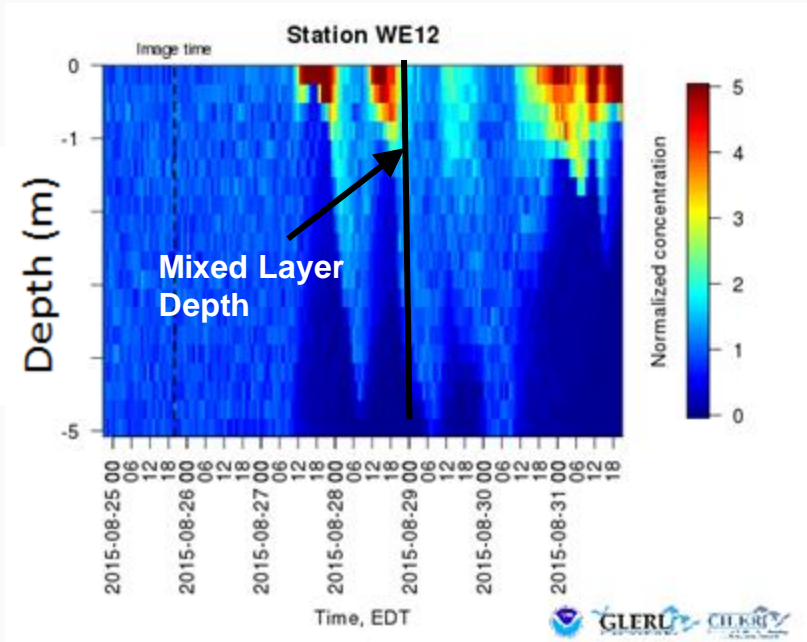
# HAB Tracker: Hindcasts

- Looking at monitoring & buoy data from prior years to evaluate model accuracy



# HAB Tracker: Improving Forecasts

## Vertical Distribution

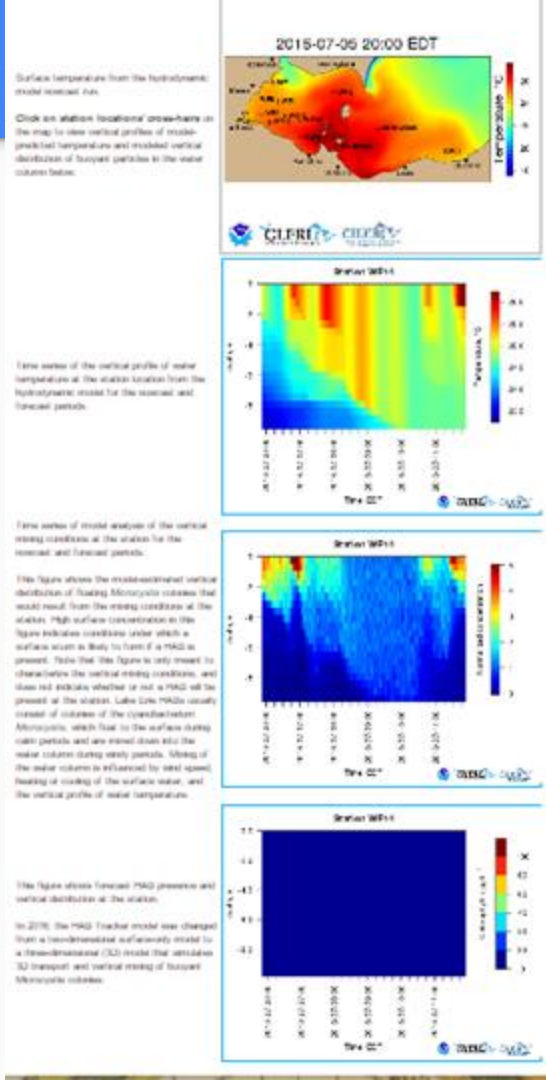


## Vertical Mixing

- What's happening below the surface?
- Will it mix to the bottom?

# HAB Tracker: Vertical Mixing

- Current surface temperatures
- Predicted vertical profile of water temp at station over time
- Predicted potential for vertical mixing of bloom at station
- HAB Tracker prediction for vertical mixing of bloom at station



# Thank You! Questions?

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# Citations

Michalak, A. et al. (2013) “Record-setting algal bloom in Lake Erie caused by agricultural and meteorological trends consistent with expected future conditions.” PNAS 110(16): 6448-6452.

# What contributes to HAB growth in Western Lake Erie?

- Lots of Nutrients (Primarily Maumee River)
- Shallow (warm)
- Weak water circulation



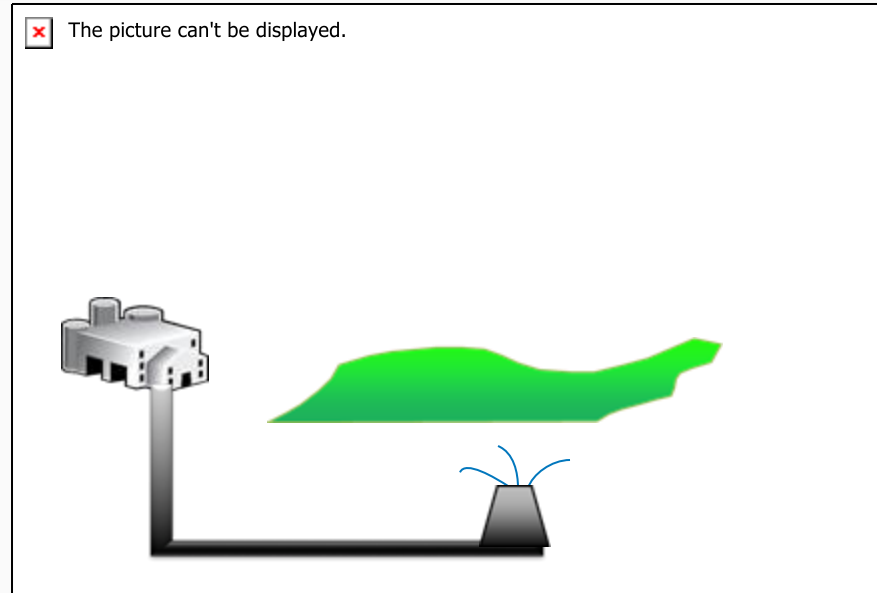
# Impacts of HABs in Lake Erie

## Harm to People

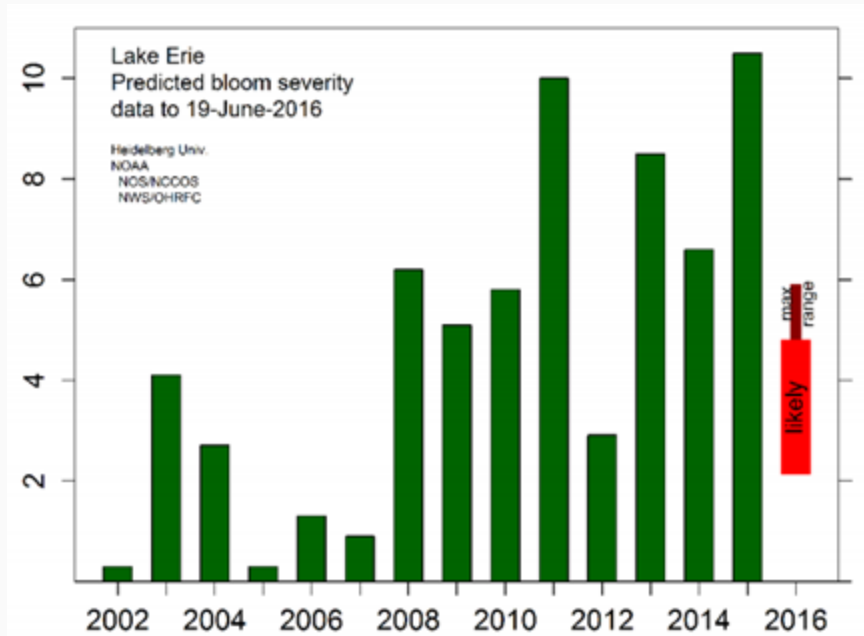
- Polluted Drinking Water
- Peaks during tourism, fishing, recreation months

## Harm to Pets & Wildlife

- Can poison pets
- Decreased light harms aquatic plants



# Trends in HAB Growth



- HABs reemerged in early 2000s
- Problem will likely continue, but agencies working to address problem (Michalak, 2013)